THE WEATHER AND CIRCULATION OF AUGUST 1950 [1]

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The average weather in the United States in August 1950 was basically similar to that observed during the preceding month (see July 1950 Monthly Weather Review). Monthly mean temperatures during August were again predominantly below normal east of the Continental Divide and above normal to the west (Chart I). Likewise both rainfall (Chart V) and cloudiness (Chart IV) were excessive in southern and central portions of the Plains and the Mississippi Valley. The recurrence of this weather pattern was reflected in the seasonal anomalies for the summer of 1950, reproduced in figure 1. These are characterized by below normal temperatures and above normal rainfall in most of the eastern two-thirds of the country, and above normal temperatures and below normal rainfall in most of the western third of the Nation. On the whole this summer was probably the coolest and rainiest since 1915 in the United States east of the Continental Divide. In portions of the Great Lakes region the temperature did not exceed 90° F. all summer, and 1950 was reminiscent of the famous "year without a summer".

Marked persistence of the weather anomalies in the United States was accompanied by an equally striking persistence of the basic circulation patterns. Thus during August, as in July, a mean trough in the constant pressure surfaces was located in eastern North America at all levels of the troposphere from 700 mb. to 300 mb. (Charts IX to XI), while a mean ridge was present in the western part of the continent, roughly along the Continental Divide. 700-mb. heights were below normal [2] throughout the length of the trough, from Baffin Bay to the Gulf of Mexico, and above normal throughout the ridge, from Alaska to Mexico (fig. 2). As a result mean geostrophic air flow at 700 mb. was almost due northerly relative to normal throughout central North America, and repeated invasions of cool Canadian air penetrated southward into central and eastern United States. These polar outbreaks accompanied the movement of a relatively large number of anticyclones from central and western Canada into the northern and central Plains and the Lakes region along tracks shown in Chart II. Rapid warming of the polar air by insolation in central and eastern United States was probably prevented by frequent frontal passages and by large amounts of cloudiness in the vicinity of the trough aloft. Thus, comparison of figure 2 with Charts I, IV, and V (inset), reveals that during August, as in July, there was generally good agreement between the areas of cyclonic curvature and negative height anomaly at

[1] See Charts I-XI, following p. 160, for analyzed climatological data for the month.

[2] The 700-mb. height anomalies for August 1950 were computed from revised normals now being prepared in the Extended Forecast Section. These revised normals will be used for all subsequent articles in this series.

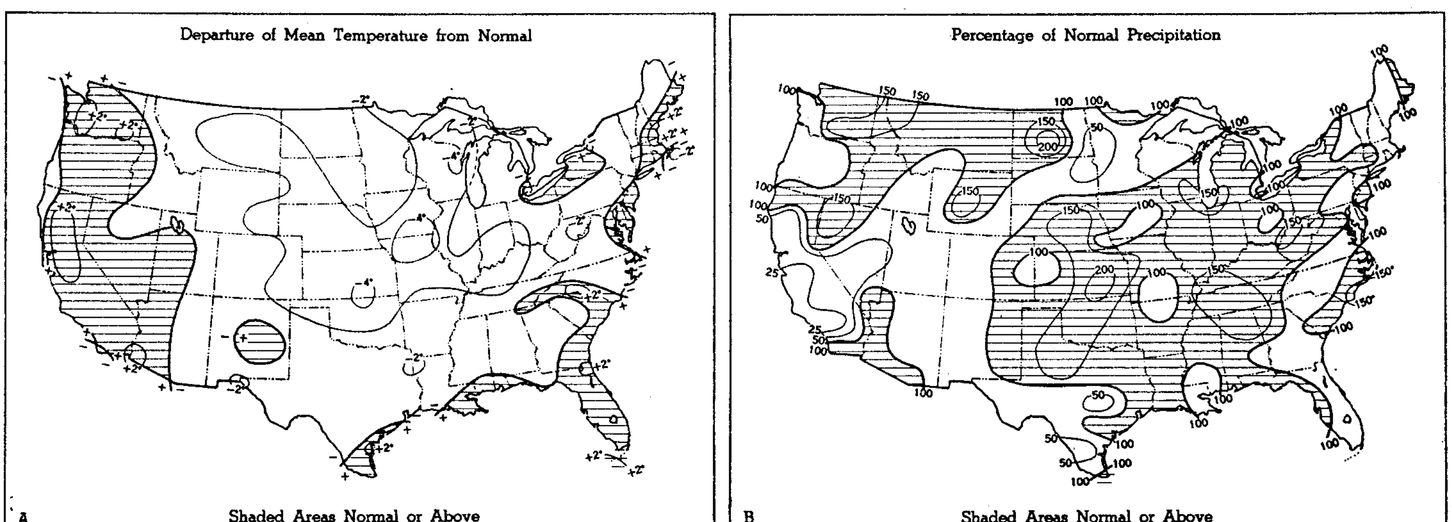


Figure 1.—Charts showing average temperature and precipitation anomalies for the summer of 1950 (June through August). Temperature departure from normal is shown in degrees Fahrenheit. (Based on preliminary telegraphic reports. From the "Weekly Weather and Crop Bulletin" for the week ending September 12, 1950.)

700 mb. and the regions of much cloudiness, sub-normal temperature, and above-normal rainfall at the surface.

The principal difference between the mean 700-mb. map for August and that for July in the vicinity of North America was the presence of a weak trough off the East Coast, from Nantucket south to the Bahamas, during August (fig. 2). The extremely short wavelength between this trough and the full latitude trough in eastern North America is difficult to rationalize, but it may be due to the fact that the Atlantic trough is mainly a low latitude feature of the circulation with 700-mb. flow from an easterly direction relative to normal throughout its length. An interesting parallelism may be noted between the two trough lines and the tracks of two tropical hurricanes (Chart III) one up the eastern Mississippi Valley and the other off the East Coast. Between the two troughs a weak but distinct 700-mb. ridge extended from a high center in Florida northward to Lake Erie. Anticyclonic curvature in this ridge was primarily responsible for deficient rainfall (Chart V inset) and slightly above normal temperatures (Chart I) in portions of the East Coast States. These conditions were also favored by the presence of a monthly mean 1018-mb. High centered in West Virginia at sea level (Chart VI). Easterly winds south of this High were stronger than normal (Chart II inset). They transported relatively cool maritime air from the Atlantic and were probably responsible for below normal temperatures in eastern Florida and South Carolina (Chart I).

The 700-mb. ridge in the western part of the United States was better developed in August than in July. In this region heights were well above normal and anticyclonic curvature was pronounced at 700 mb. (fig. 2). Correspondingly, surface temperatures were above normal (Chart I), sunshine abundant (Chart IV), and rainfall deficient (Chart V inset) in practically all areas from the Continental Divide to the Pacific Ocean. Temperatures averaged more than 2° above normal and there was no measurable precipitation in parts of Washington, Utah, Nevada, California, and Arizona (Chart V). These conditions culminated on September 1 in an all-time nationwide September heat record of 124° at Yuma, Ariz. and were accompanied by extensive forest fires in California.

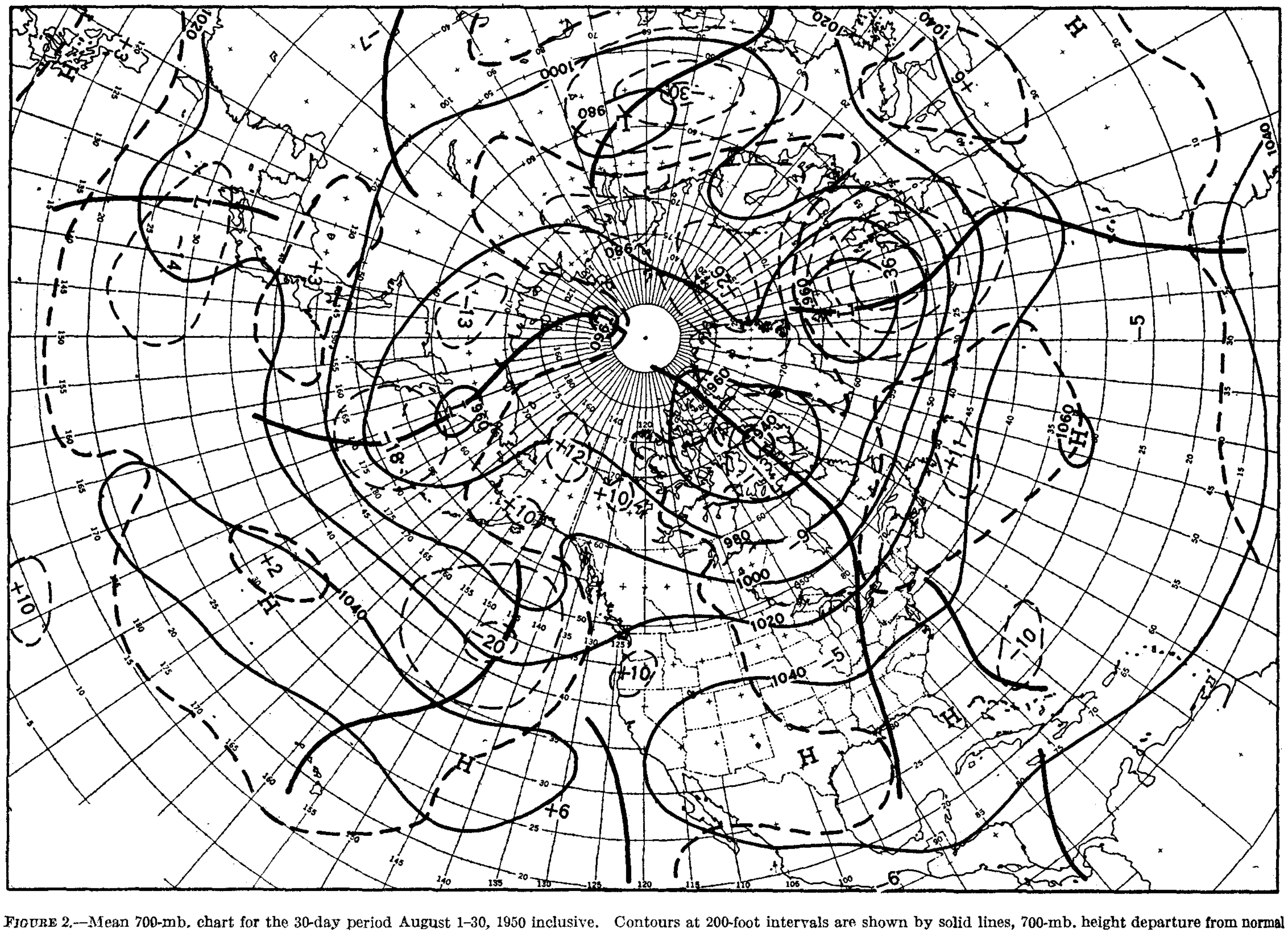


Figure 2.—Mean 700-mb. chart for the 30-day period August 1–30, 1950 inclusive. Contours at 200-foot intervals are shown by solid lines, 700-mb. height departure from normal (based on revised normals being prepared by Extended Forecast Section) at 100-foot intervals by dashed lines with the zero isopleth heavier. Anomaly centers are labeled in tens of feet. Minimum latitude trough locations are shown by heavy solid lines.

Hot dry weather in the Far West was also reflected in a well-developed thermal trough at sea level (Chart VI), and it accentuated the normally strong thermal gradient between coastal and interior California. Consequently strong sea breezes, as indicated by the Los Angeles wind rose, produced below normal temperatures along the coast of southern California (Chart I).

Along practically the entire Gulf Coast temperatures were above normal (Chart I), skies were clear more than half the time (Chart IV), and rainfall was deficient (Chart V inset) during August. These weather anomalies were associated with a flow of relatively dry air from a northerly direction both at 700 mb., where winds were more northwesterly than normal (fig. 2), and at sea level, where winds were from a northeasterly direction relative tc normal (Chart II inset). This circulation cut off the normal source of moisture and weakened the prevailing cool sea breeze from the Gulf of Mexico. In addition an east-west ridge line extended along the Gulf Coast at 700 mb. and probably suppressed convective activity. Chart I shows a sharp dividing line through central portions of Texas, Louisiana, Mississippi, Alabama, and Georgia between below normal temperatures to the north and above normal temperatures to the south. This boundary coincided with a slow moving polar front on many individual weather maps during August but it is not well delineated on the monthly mean pressure maps.

Rainfall was deficient in most of the Northern Plains and Great Lakes regions (Chart V inset) despite the presence of cyclonic curvature and negative height anomalies at 700 mb. (fig. 2). This may be attributed to the prevalence of anticyclonic conditions at sea level, as attested by the large number of migratory Highs which traversed the region (Chart II), the existence of anticyclonic curvature in the monthly mean sea level isobars (Chart VI), and the fact that monthly mean pressure at sea level was generally above normal (Chart II inset). On the other hand, in southern and central parts of the Plains and Mississippi Valley, where rainfall exceeded the normal by more than 2 inches, cyclonic conditions aloft were complemented by cyclonic curvature in the mean sea level isobars (Chart VI). Contributing factors to the excess precipitation in the western Plains were upslope action, indicated by southeasterly flow relative to normal, (Chart II inset), and the presence of a quasi-stationary frontal zone along the Divide during many days of the month.

In conclusion, it is noteworthy that marked persistence of the basic circulation pattern from July to August 1950 was evident in most of the Northern Hemisphere as well as in the United States. Comparison of figure 2 for August with figure 1 of the article on the July weather and circulation in the Monthly Weather Review shows that during both months the Icelandic Low was southeast of its normal position, the Azores High was displaced to the northwest, a strong blocking type ridge was located over Scandinavia, and a deep trough ran along the Ural mountains. The eastern cell of the Pacific High however, was much weaker and farther south in August than in July. 700-mb. heights were below normal in most of the eastern Pacific in August, and a deep polar trough extended from the Gulf of Alaska southward to 30° N., 155° W., where it joined a well-developed easterly wave over the Hawaiian Islands. This circulation pattern was associated with generally heavy rainfall over the Hawaiian Islands, where a true hurricane made one of its rare appearances in mid-August.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, August 1950

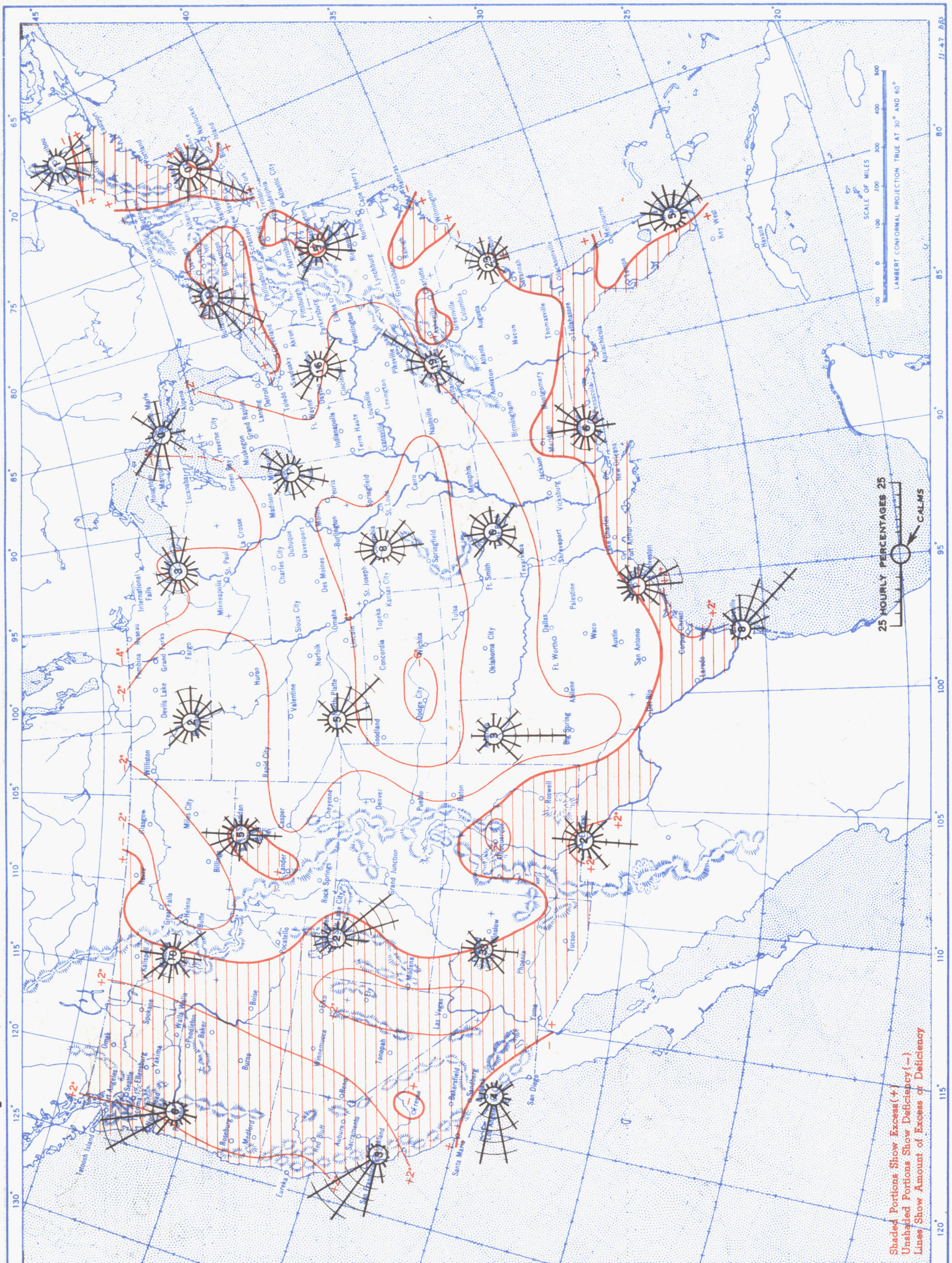


Chart II. Tracks of Centers of Anticyclones, August 1950. (Inset) Departure of Monthly Mean Pressure from Normal

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time). Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart III. Tracks of Centers of Cyclones, August 1950. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of cyclone at 7:30 a. m. (75th meridian time) Dots indicate intervening 6-hourly positions. Figure above circle indicates date, and figure below, pressure to nearest millibar. Only those centers which could be identified for 24 hours or more are included.

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, August 1950

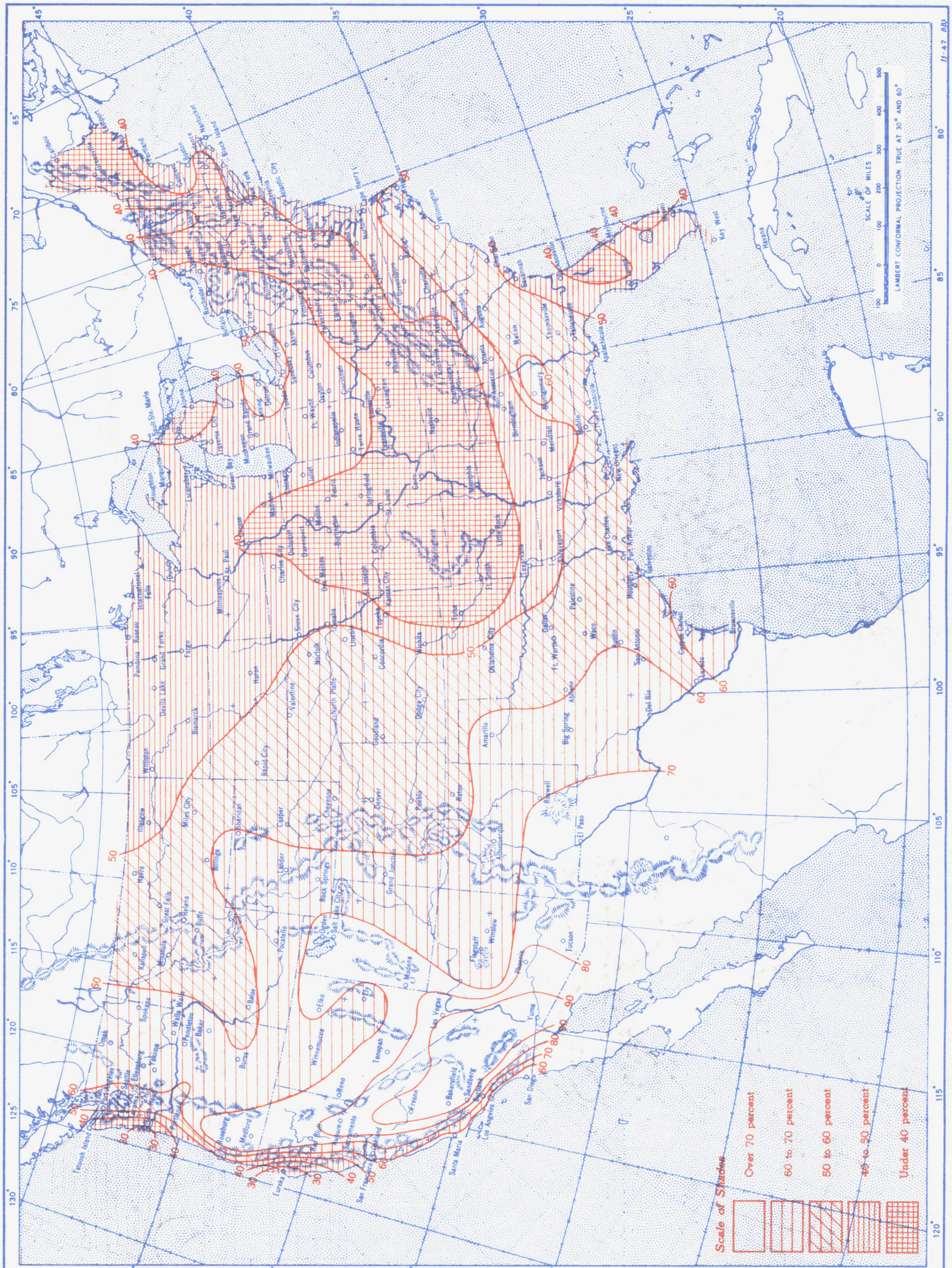


Chart V. Total Precipitation, Inches, August 1950. (Inset) Departure of Precipitation from Normal

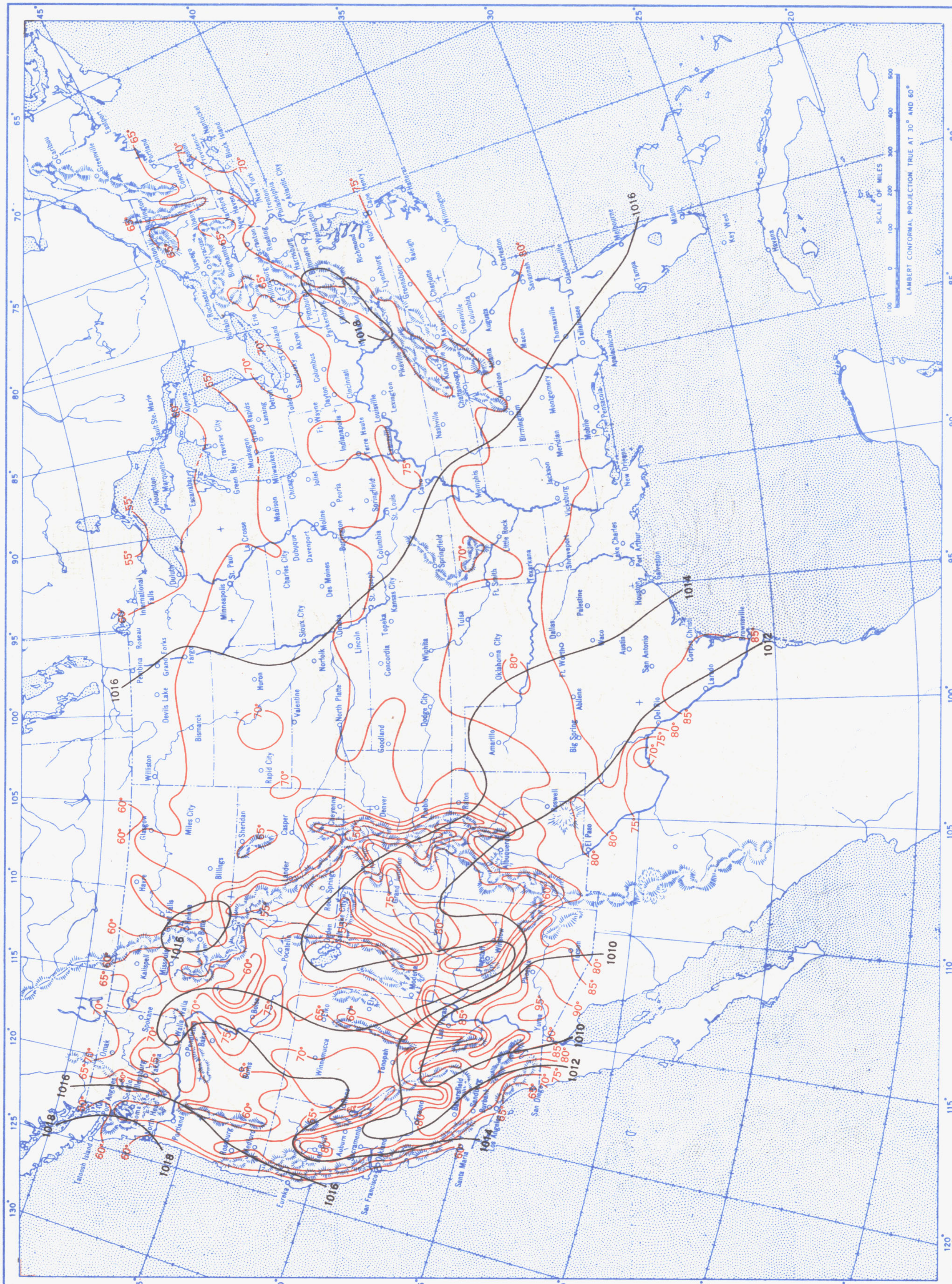
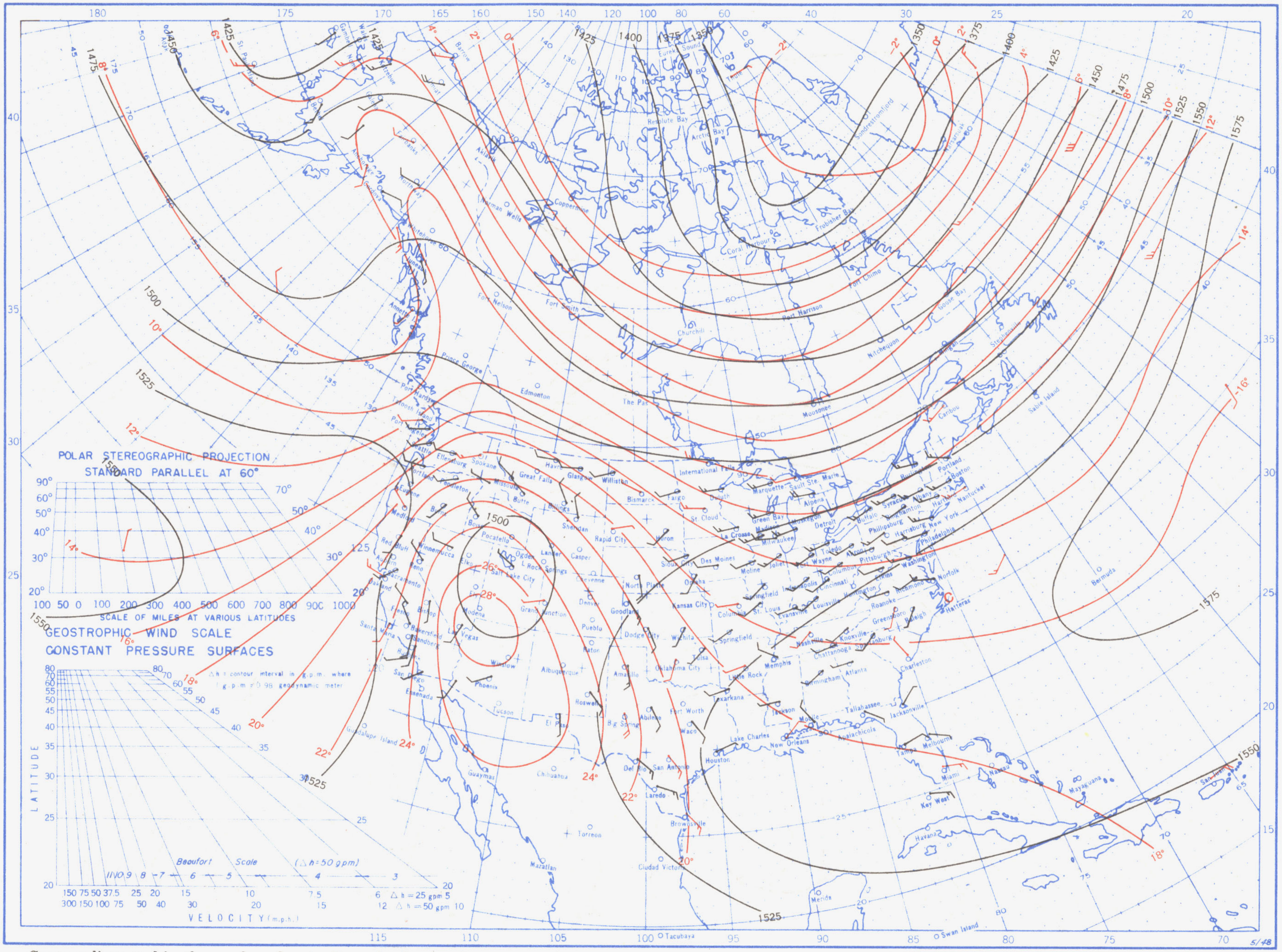


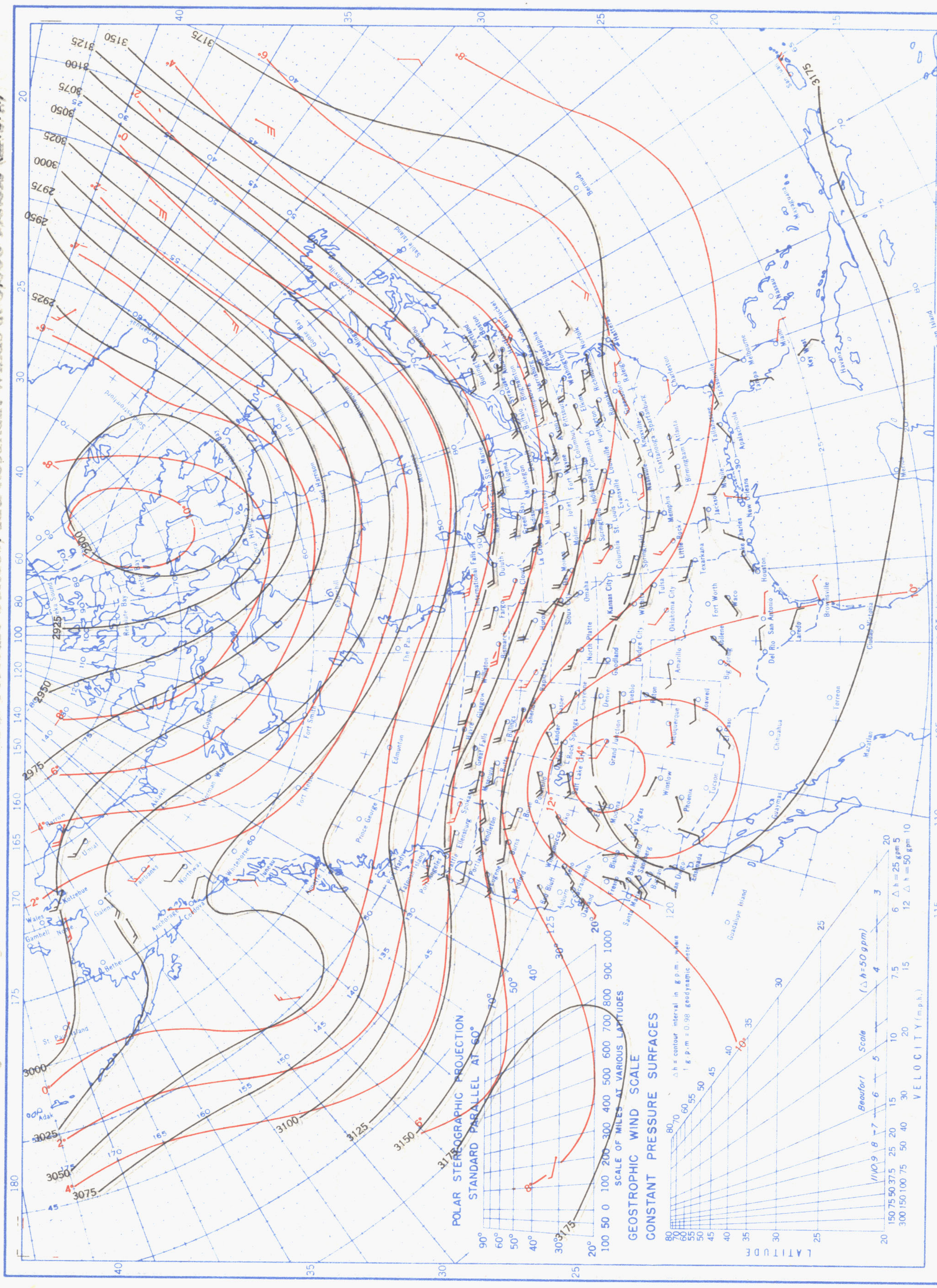
Chart VI. Mean Isobars (mb.) at Sea Level and Mean Isotherms (°F.) at Surface, August 1950

Chart VIII, August 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 850-millibar Pressure Surface, and Resultant Winds at 1,500 Meters (m. s. l.)



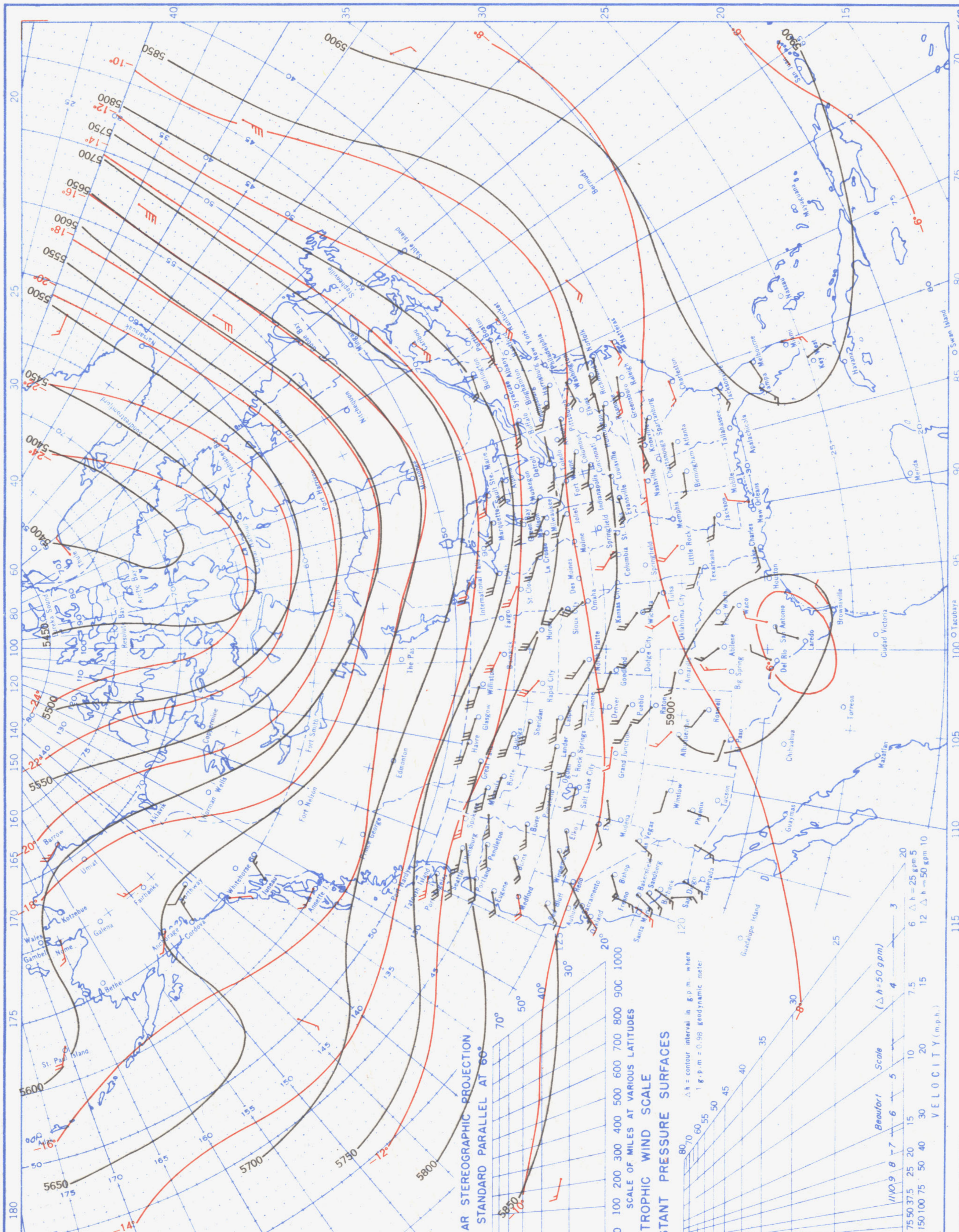
Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart IX, August 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 700-millibar Pressure Surface, and Resultant Winds at 3,000 Meters (m. s. l.)



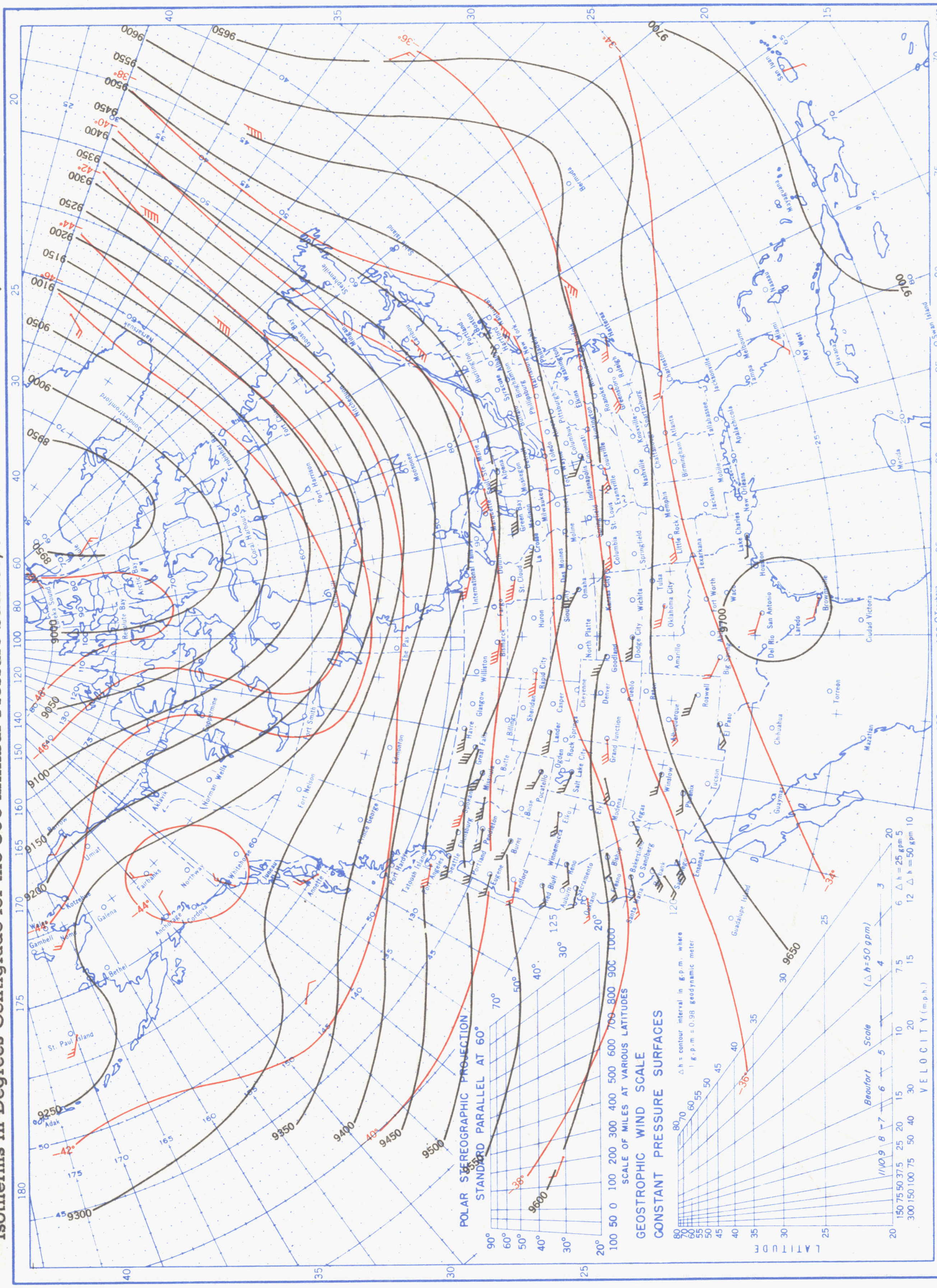
Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart X, August 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 500-millibar Pressure Surface, and Resultant Winds at 5,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.

Chart XI, August 1950. Contour Lines of Mean Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Mean Isotherms in Degrees Centigrade for the 300-millibar Pressure Surface, and Resultant Winds at 10,000 Meters (m. s. l.)



Contour lines and isotherms based on radiosonde observations at 0300 G. C. T. Winds indicated by black arrows based on pilot balloon observations at 2100 G. C. T.; those indicated by red arrows based on rawins taken at 0300 G. C. T.